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Short Communication

New records of two marsupials (Didelphimorphia, Didelphidae) and conservation notes from southern Mexico

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Abstract

In Mexico opossums are difficult to find, and much of their natural history, ecology, and behavior are unknown. Through photographic and visual records, we obtained data on the presence of two species of marsupials in southern Mexico. We report new municipal records of Derby's woolly opossum, *Caluromys derbianus* in Veracruz, and new municipal records of the Gray four-eyed opossum *Philander opossum* for Oaxaca, Veracruz, and Chiapas. Local mammal records are crucial for understanding the biology and ecology of species, as well as identifying its threats.

Key words: *Caluromys*, Chiapas, Derby's woolly opossum, distribution, Gray four-eyed opossum, Oaxaca, opossums, *Philander*, threats, Veracruz

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Mexico holds nine species of opossums that can be found throughout the country except for the Baja California Peninsula (Medina-Romero et al. 2012; Ortiz-Acosta et al. 2024). They are commonly associated with Neotropical rainforests, but they have also been found in fragmented and disturbed habitats in this country (Medina-Romero et al. 2012). This paper deals with two species of opossums, the Derby's woolly opossum, *Caluromys derbianus* (Waterhouse 1841), and the Gray four-eyed opossum, *Philander opossum* (Linnaeus 1758).

The Derby's woolly opossum is the largest species of the genus *Caluromys* Allen, 1900, with a mean total length of 414.5 mm and 300 g (Gardner 2007; Bastidas-Domínguez et al. 2021). It is characterized by salmon-pink-colored ears and nose, three orange-golden patches on the neck and shoulders, a wooly section on the sides of the body, and a coat bearing a grayish-white, long-haired, and hairy tail up to about mid-tail (Bucher and Hoffmann 1980; Gardner 2007; Bastidas-Domínguez et al. 2021). This species has a well-developed marsupial pouch, which is not well-developed in other species of the genus *Caluromys* (Gardner 2007). It is a nocturnal, primarily arboreal, and solitary marsupial (Hall and Dalquest 1963). It lives in primary and disturbed tropical

rainforests, ranging from sea level to 3,600 m (Gardner 2007). It is distributed from San Luis Potosí, south-central Veracruz in Mexico, to western Colombia, and northern Ecuador (Gardner 2007; Pérez-Gracida and Serna-Lagunes 2021). In Mexico, the species has been reported from a few localities of seven states, with most of the previous records coming from the state of Veracruz, following Chiapas, and Tabasco (Pérez-Gracida and Serna-Lagunes 2021).

The Gray four-eyed opossum is characterized by dark grayish face with large and well-defined pale supraocular spots, chin, and cream cheeks; the pelage of dorsum is uniformly gray or dark gray, whereas pelage of ventral regions is cream, with pale gray on throat and between hind and forelimbs, with a black tail that turns white at the last third (Castro-Arellano et al. 2000; Lew et al. 2006; de la Sancha et al. 2016). It shows cursorial or scansorial habits, being terrestrial, nocturnal, and solitary marsupial, with good swimming abilities (Castro-Arellano et al. 2000; de la Sancha et al. 2016). It occurs in Central and South America, from Tamaulipas in Mexico, to southern Brazil, and northern Argentina (Castro-Arellano et al. 2000; de la Sancha et al. 2016). It mainly inhabits primary and secondary rainforests, ranging from sea level to 1,600 m (de la Sancha et al. 2016). It is the only member of the genus *Philander* found in Mexico, where it has been recorded in the southern part of Tamaulipas and along the coastal plain of the Gulf of Mexico, including the states of San Luis Potosí, Hidalgo, Puebla, Veracruz, Oaxaca, Chiapas, and Yucatan (Castro-Arellano et al. 2000; de la Sancha et al. 2016).

Both opossums are classified as Least Concern by the International Union for Conservation of Nature (Solari and Lew 2015; de la Sancha et al. 2016). However, in Mexico, *Caluromys derbianus* is cataloged as Threatened (A) while *Philander opossum* is not included in the Official Mexican Legislation NOM-ECOL-059-SEMARNAT-2010 (SEMARNAT 2019). Despite their wide distribution range, they are poorly recorded, and much of their natural history, ecology, and behavior are unknown (Bucher and Hoffmann 1980; Ortega et al. 2021; Chacón-Pacheco et al. 2023). Here, we document recent records of *Caluromys derbianus* in Veracruz and for *Philander opossum* from the states of Oaxaca, Veracruz, and Chiapas based on photographic and visual records.

Our observations were obtained with photographic cameras and smartphone devices from 2016 to 2023. We recorded the coordinates (DATUM WGS84) using a GPS (Garmin GPSMAP 65) Garmin International, Inc. (2020). The opossums were identified following Gardner (2007) and Reid (2009). We used the R version 4.2.3 (R Core Team 2023) to obtain previous vouchered records with catalog numbers (GBIF.org 2024a, GBIF.org 2024b) of each species, and to remove duplicate records and records without coordinates, we used the Species Occurrence Data Sources-spooc package (Owens et al. 2023), and COORDINATECLEANER package (Zizka et al. 2019) from R version 4.2.3 (R Core Team 2023). In addition, literature records of both species in Mexico were consulted (Lira-Torres et al. 2012; Pérez-Irineo and Santos-Moreno 2012; Cruzado-Cortés and Salinas-Rodríguez 2016; Galindo-Aguilar et al. 2019; Pérez-Gracida and Serna-Lagunes 2021; Ramos-Luna et al. 2023). We created maps of each species (Fig. 1) with these data (https://zenodo.org/records/10791257; https://zenodo.org/records/10791291) using SimpleMappr (February, 2024). Available online: https://www.simplemappr.net./ (Shorthouse 2010) and edited in Adobe Illustrator Adobe Inc. (2018). Adobe Illustrator [Computer software]. Available from https://www.adobe.com/products/illustrator.html.

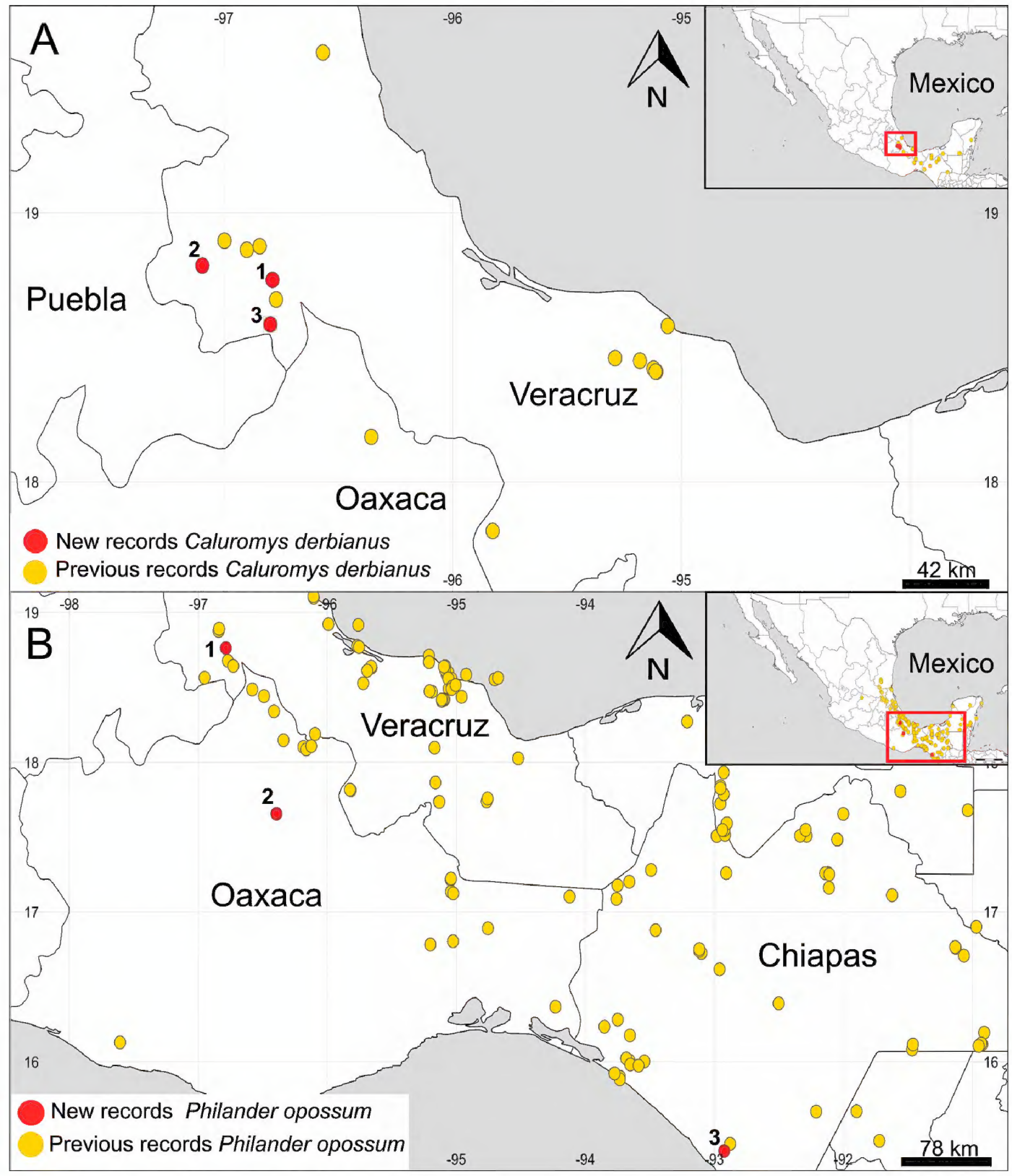

Figure 1. Geographic distribution of two marsupials in Mexico **A** *Caluromys derbianus* and **B** *Philander opossum*. Only new records are labeled with numbers.

Caluromys derbianus (Waterhouse, 1841)

Record 1. Cuichapa, Veracruz (18.7513°N, 96.7878°W, 415 elevation), May 10, 2016. We observed a road kill of a female individual on the edge of a road. Alongside the specimen, there were two young, which were recovered by a villager. One of them did not survive while the second was assisted in captivity (Fig. 2 A, B). The site consists of a patch of high evergreen forest, but immersed in a matrix of sugar-cane crops and close to human settlements.

Record 2. Tlilapan, Veracruz (18.8044°N, 97.0947°W, 1200 elevation), December 22, 2017. An adult male was found near a rural road, with difficulty moving; it was taken into captivity by local villagers (Fig. 2 C). The site was surrounded by a high evergreen forest, human settlements, and irrigated agricultural lands nearby.

Record 3. Las Lajas, Tezonapa, Veracruz (18.5859°N, 96.7974°W, 435 elevation), December 12, 2023. We took a picture of a dead individual who had been electrocuted on high-tension power lines (Fig. 2 D) at a height of around 5 meters. The site was surrounded by a high evergreen forest associated with coffee and banana plantations.

Philander opossum (Linnaeus, 1758)

Record 1. Cuichapa, Veracruz (18.7630°N, 96.7876°W, 420 elevation), July 10, 2017, at 00:30 hrs. We observed an adult individual, on a tree approximately 3.5 meters high. The site was surrounded by a sugar-cane field and irrigated agricultural lands.

Record 2. La Esperanza, Santiago Comaltepec, Oaxaca (17.6563°N, 96.3954°W, 500 elevation), March 17, 2022, at 22:13 hrs. The individual was located on the river bank in a submerged habitat between two types of vegetation, mountain cloud forest and high evergreen forest (INEGI 2019), walking among the trees at a height of approximately 3 meters (Fig. 2E).

Record 3. Rancho El Cacao, Mapastepec, Chiapas (15.4053°N, 92.9242°W, 29 elevation), March 23, 2022, at 23:00 hrs. We observed a specimen moving among the trees (*Guazuma ulmifolia*) (Fig. 2F), at a height of approximately 3 meters in the canopy. The site is intended for intensive livestock farming (cows) and grassland cultivation.

Our first record of *C. derbianus* represents the first municipal record in Cuichapa, Veracruz, where the nearest record was found 8.28 km to the southeast in Tezonapa municipality in 1943 (Moore Laboratory of Zoology [MLZ] 216). The second record represents the first municipal record of Tlilapan, Veracruz. The closest record is about 14.46 km away in the municipality of Fortín de las Flores, dating back to 1962 (Colección Nacional de Mamíferos [CNMA] 7183). The third record shows a new locality for the species, which was previously found in the Tezonapa municipality. The previous record is from 1943 and is located around 10.84 km away (Moore Laboratory of Zoology [MLZ] 217).

The adult *P. opossum* observed in Cuichapa, Veracruz is the first recorded individual for this municipality. The nearest record is from 9.57 km to the southeast in Tezonapa municipality dating back to 1943 (Moore Laboratory of Zoology [MLZ] 215). The second record of *P. opossum* is the first in Santiago Comaltepec municipality, which is about 50.28 km northeast of the nearest vouchered record in San Juan Bautista Tuxtepec, Oaxaca from 1947 (Colección Nacional de Mamíferos [CNMA] 7558). The most recent record of this species in the municipality of Mapastepec, Chiapas is 7.14 km to the east and dates back to 1943 (Colección Nacional de Mamíferos [CNMA] 169).

We recorded the *C. derbianus* in anthropized zones, including sugar-cane fields, rural roads, and high-tension cables, where we observed dead individuals. *Caluromys* members found in anthropized zones are at a higher risk of being killed by vehicles (Pérez-Gracida and Serna-Lagunes 2021; Ortega et al. 2021; Villalobos-Hoffman et al. 2022), electrocuted (Bastidas-Domínguez et al. 2021; Ortega et al. 2021) or killed by domestic animals like dogs and cats (Marineros et al. 2016; Ortega et al. 2021). For *P. opossum*, the main threats are related to the loss of habitat due to human activities like land use change and agriculture. In Costa Rica, the species faces threats from incidents of roadkill (Artavia et al. 2015; Villalobos-Hoffman et al. 2022), while in Mexico, it is threatened by predation from domestic cats (Cruzado-Cortés and Salinas-Rodríguez 2016). Opossums, in general, are stigmatized and little appreciated, possibly due to the lack of knowledge by human communities where they occur (Gardner 2007), and only a few references provide data on the conservation threats of both marsupials

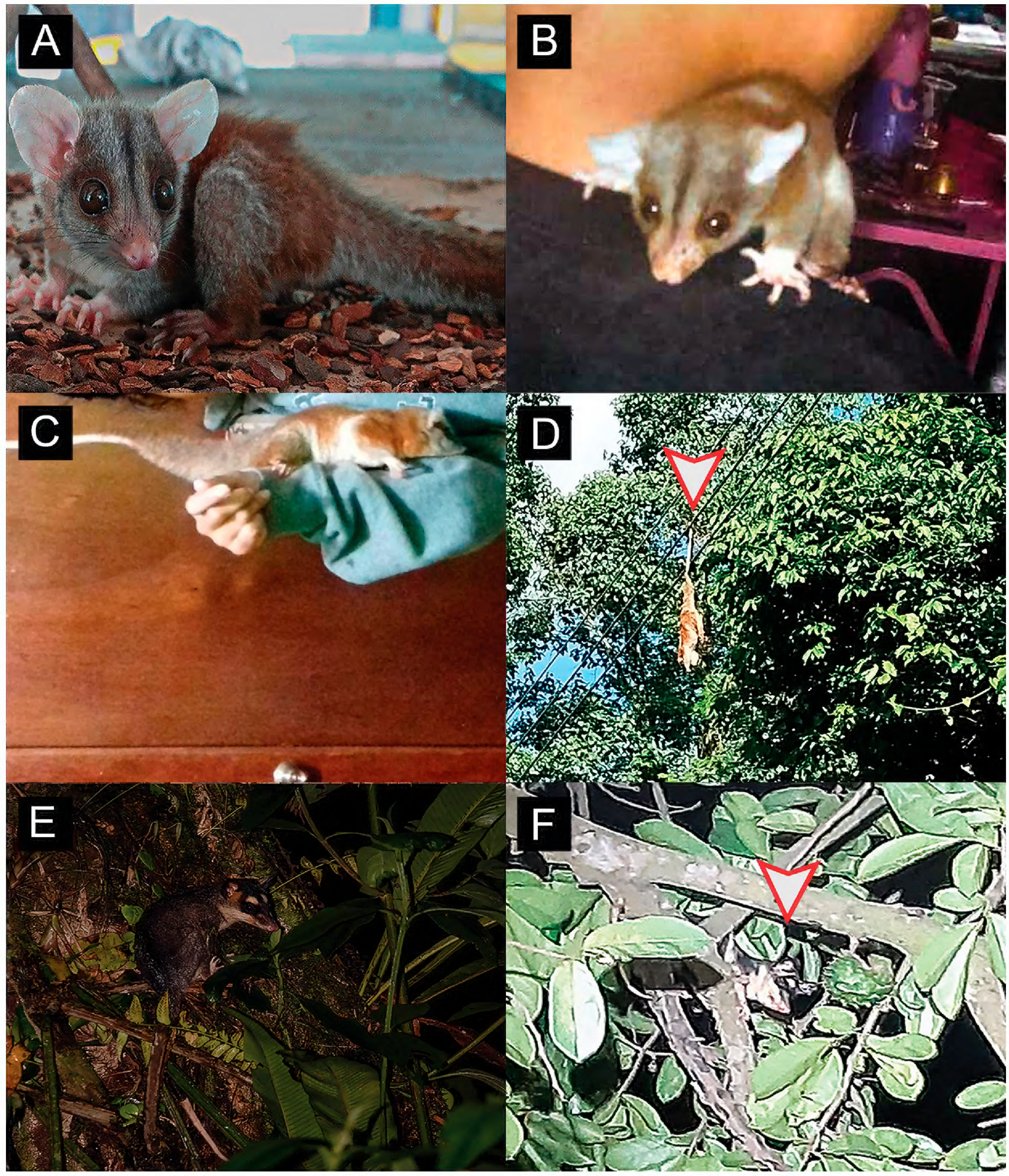

Figure 2. Photographic evidence of two marsupials in southern Mexico **A**, **B** *Caluromys derbianus*, Cuichapa, Veracruz **C** *Caluromys derbianus*, Tlilapan, Veracruz **D** *Caluromys derbianus*, Tezonapa, Veracruz **E** *Philander opossum*, Santiago Comaltepec, Oaxaca **F** *Philander opossum*, Mapastepec, Chiapas.

(Ortega et al. 2021). However, both marsupial species are ecologically important where they occur because Derby's woolly opossum has a varied diet, including fleshy fruits, insects, small vertebrates, plant material, nectar, pollen, and possibly carrion (Bucher and Hoffmann 1980), and the Gray four-eyed opossum acts as a predator but also contributes to seed dispersal (de la Sancha et al. 2016).

Understanding the spatial distribution of marsupials is crucial for identifying priority areas for conservation, designing suitable management strategies, and assessing population status (Medina-Romero et al. 2012; Chacón-Pacheco et al. 2023; Ortiz-Acosta et al. 2024). The occurrence data for a given species could be

useful for updating a distribution map and refining the estimated potential distribution (Amaral et al. 2023). It also helps detect threats such as habitat loss, landscape fragmentation, and the interaction with natural predators and introduced species (Pérez-Gracida and Serna-Lagunes 2021). Opossums play an important role in seed dispersal and are omnivorous, making them key elements in trophic networks (Bucher and Hoffmann 1980; Castro-Arellano et al. 2000; Gardner 2007).

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

Conceptualization: MA, AMR, CCJC, AICC. Data curation: AMR, AICC, CCJC, MA. Formal analysis: CCJC, MA, AICC. Investigation: MA. Methodology: AICC, MA, CCJC. Project administration: CCJC. Software: CCJC. Supervision: AICC, CCJC. Visualization: AMR. Writing - original draft: AICC, CCJC, MA. Writing - review and editing: AICC, MA, CCJC.

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Data availability

All of the data that support the findings of this study are available in the main text.

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